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Analysis of the factors that determine food acceptability

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Abstract
Food acceptability directly relates to the interaction food has with the consumer at a given moment in time. The factors that affect food acceptability which is covered in this paper include customer characteristics, sensory characteristics of food and the 'feel good' factor. Through research, this paper confirms that sensory characteristics of food are considered the key area in which food manufacturers can successfully use to differentiate their products to help enhance their acceptability. Under sensory characteristics, the paper extensively discusses the influence of aroma, appearance, taste, and texture on food acceptability. For instance, it confirms that food texture controls the belief about satiation effects of beverage or foods which ultimately influence food acceptance at a particular time period. With regard to the "feel good" factor, the paper explains that consumers are more inclined to accept foods that satisfy their need in terms of enjoyment as opposed to those they consider to be less tasty. Also covered, are consumer characteristics; knowledge, innovativeness, attitude, belief, and perception of particular food products and their impact on food acceptability

Keywords: Satiation, acceptability, aroma, texture, appearance and consumers

Introduction
The acceptance or rejection of food entirely depends on whether it corresponds to consumer expectations and needs (Mosca *et al*., 2015) [15]. The process through which an individual accepts or rejects food is considered to be of a multi-dimensional nature. The structure of food acceptability is both variable and dynamic among individuals in different groups and the same individuals in different time periods and contexts. Simply put, food acceptability directly relates to the interaction it has with the consumer at a given moment in time. The key factors that determine food acceptability are the sensory characteristics of food since consumers seek foods with specific sensory properties. Other critical factors that directly dictates food acceptability are consumer characteristics and enjoyment of food.

Enjoyment of Food (the 'feel good' factor)
People consume food for a varied number of reasons. The most obvious and logical reason being to acquire the optimum nutrition for healthy living (Mosca *et al*., 2015) [15]. However, the modern world experiences more than adequate food supply to cater for the nutritional requirements of the population. This has brought about the need to understand what prompts consumers to accept and reject certain types of foods. One of the important factors that determine food acceptability but is normally overlooked by manufacturers is that consumers mostly prefer foods that they enjoy. Since time immemorial, certain types of foods have been consumed specifically due to the pleasure that they offer the consumers. Foods such as ice cream, coffee, alcohol, and chocolate have normally been consumed to promote a positive state of mind or to reduce the negative states of mind (Kim, Lee, & Kim, 2016) [12].
In the twenty-first century, the increasing demand for healthy food has placed manufacturers in a complex state. Manufactures are perplexed as to how they need to reduce levels of sugar or fat from a given food product and not spoil the enjoyment consumers derive from the same product. Some consumers expect the healthy food products to taste even better. Therefore, it is a challenge to produce healthy foods that meet the enjoyment derived from food products. Nevertheless, while manufacturing new products, the enjoyment component of the food product should remain one of the driving factors that the food processors should consider. Consumers are more inclined to accept foods that satisfy their need in terms of enjoyment as Opposed to those they consider less tasty (Kim, Lee, & Kim, 2016) [12].

Consumer characteristics

Consumer expectations

According to Sinesio, Saba, Peparaio Civitelli, Paoletti and Moneta (2018) [21], there is a strong link between consumer expectations of a given product and their acceptance of the product. Consumers have the tendency to compare the expectations they have on the sensory properties of food and the actual properties delivered by the product. They are conscious about how the actual product compares with the representation given by the label on the package, how its taste compare with the one described by the advert and how its performance relates to the one indicated by the manufacturer (Sinesio *et al*., 2018) [21]. It is thus crucial for manufacturers to consider consumer expectations when availing new products into the market. The expectations of the consumers must be built and delivered by the product, otherwise, the manufacturer of the product may end up being sidelined by the consumers in almost all its future products.

Consumer Innovativeness

Consumer innovativeness is considered to be a personality possessed by consumers who are always eager to try out new products. This aspect is normally tested using domain-specific innovativeness (DSI) scale. The scale is reliable and is the preferred method of measuring the tendency of consumers to be the first to try out food products in various segments. Consumer innovativeness has a strong positive relationship with the acceptance of new products in the market (Simons & Hall, 2018) [20].

Consumers' Knowledge and Belief

According to the study conducted by Simons and Hall (2018) [20], the belief of a consumer regarding a particular product has a positive outcome for acceptability of the product. This aspect of consumer characteristics has a great influence on the acceptability of new products by the different segment of consumers. Knowledge dictates the basis for food preference and its acceptability. The success of any new food product in the market usually follows diffusion of its knowledge to the customers. Knowledge about the composition, functional properties and to some extent the processing steps influence whether the food product will be accepted or rejected by the consumers (Hieke, & Grunert, 2018) [9].

Consumers' Attitude

Attitudes towards Functional Foods

In most cases, functional foods have low acceptability among various consumers. With reference to Mouta, Menezes, and Melo (2016) [16], functional foods are mainly bought by consumers who are at least thirty five years. People consume these foods for specific reasons. Some consume them for health benefits such as prevention of diseases and access to protective properties of the foods. The main factor that promotes acceptance of functional food is its health properties (Mouta, Menezes, & Melo, 2016) [16]. Therefore, youths mainly avoid consumption of such food products.

Attitudes towards Healthy Foods

The labeling regarding health value, characteristics, and price of fat influences the intention of the consumer to buy the product and accept it. Packed fruits and minimally-processed vegetables preserve the properties of fresh products at an increased functionality and thus are considered crucial for health (Hartmann *et al*., 2018) [8]. Consumers normally accept these products due to their convenience during food preparation in addition to their nutritional value.

Low-fat food products have extensively been studied with reference to their acceptability. It is indicated that the positive belief on low-fat food products' in relation to health increases their acceptability (Hartmann *et al*., 2018) [8]. However, high-fat food products are liked and normally accepted due to their good taste. Interestingly, studies on the labeling of low-fat content indicate that it normally decreases the intention to purchase and accept chocolate snacks (Zellner *et al*., 2018) [25].

Sensory Characteristics

According to Piqueras-Fiszman, and Spence (2015) [18], sensory characteristics of food such as taste, texture, aroma, and appearance have distinct and influential effects on food acceptability. In a variety of ways, sensory characteristics of food are considered the key area in which food manufacturers can successfully use to differentiate their products. The choice and accessibility of food products have never been so critical in the society as compared to the modern world. In today's world, as consumers walk along streets and local food stores, they are bombarded by product information. This makes consumers to be faced with the choice to try out each product and establish preference on which product to rate higher than the others. In-store tasting is slowly becoming a common practice since manufacturers are becoming more conscious about different methods of food preparation which actually delivers most preferred products (Piqueras-Fiszman, & Spence, 2015) [18].

When consumers finally consume food products and experience their sensory characteristics, they gain the ability to decide whether they like or dislike the product. The sensory characteristics; taste, aroma, texture, and appearance of food specifically influence the decision that a consumer makes regarding the preference of food substance (Kostyra *et al*., 2016) [13]. It is thus vital for food producers to optimize the sensory attributes perceived by the consumers of a given product. This directly improves the product's perceived value among various consumers. The sensory cues based on food's aroma, taste, appearance, and texture are extremely critical before, during and after eating (Kostyra *et al*., 2016) [13]. These properties direct consumers towards the food source, preferences, selection, and satisfaction from the consumed food.

Aroma

Food aroma forms a crucial sensory signal and a fundamental component of flavor perception and thus it shapes the way people experience taste and texture. The aroma acts as a signal of the presence of edible or inedible food even before the consumer sees the food. Therefore, various food establishments use attractive aromas of their products to entice and capture potential clients. As indicated by Cho, Yoon, Min, Lee, Tokar, Lee, and Seo (2016) [2], laboratory evidence indicate that attracting consumers with very pleasant food aromas such as those of warm cookies or pizza can easily stimulate salivation, promotes prospects of consumption and increase appetite. These effects increase the chances of food product's acceptability.

Food aroma directs food acceptability towards the food that is specifically signaled by the odor. For instance, a study conducted by Sinesio, Saba, Peparaio, Civitelli, Paoletti and Moneta (2018) [21] suggests that sub-threshold exposure of

consumers to fruit aromas prior to a meal event made participants choose more vegetable and fruit-based foods at the subsequent meal. Therefore, food aromas, whether perceived or not, direct the attention towards the food sources through the priming implicit memories and arouses anticipation of energy or nutrient associated with the consumption.

As indicated by Cox (2016) [4], low protein diet modulates neural responses in the brain sections that are associated with responses to savory food aromas. There is a distinction between the aromas acting ortho-nasally; those perceived to originate from external environment and retro-nasally; those originating from the mouth. During mastication, the aroma produced increases the intensity of the perceived food's flavor. The profile of retro-nasal aroma released depends on the physical structure of the food, for instance, food texture and characteristics of the consumer such as chewing efficiency, bite-size and eating rate (Cox, 2016) [4].

Currently, there is no published research that that links foods aroma to consumption of food beyond one meal. However, established research adequately links the functional role of aroma in short-term regulation of food acceptability. The retro-nasal aroma exposure has a consistent effect on the satiation and food acceptability. Also, the ambient odor is critical in determining the level of food acceptability among consumers (Tauferova *et al*., 2015) [23]. Therefore, food processors could use them to create sensory-specific appetites for healthy food types.

Taste

Taste refers to the proximal sense that requires direct contact of food with stimuli on the tongue to determine the quality of the ingested food. The basic tastes such as umami, sour, sweet, bitter and salty are important in signaling nutrient-rich foods. Sweet taste infers high concentration of carbohydrates, specifically monosaccharaides, while salty and savory tastes are associated with proteins and electrolytes (Romagny, Ginon, & Salles, 2017) [19]. Bitter and sour tastes, on the other hand, are associated with unripe fruits or foods that may be harmful when ingested.

Children normally have high acceptability to salty and sweet tastes and an aversion to sour or bitter foods. Small changes in the taste of food substance can have a relatively large effect on its acceptability due to the effect of increased palatability. For instance, when a bland food is made more palatable by adding salt, spices, herbs, and sweetness people tend to easily accept and consume most of the food that they previously did not prefer consuming (Romagny, Ginon, & Salles, 2017) [19]. The effect of taste on food acceptability is strongly correlated with the personal preferences that people have. For example, people who like the sweet taste as opposed to savory ones tend to eat more sweet rice compared with the sour version of the rice (Cho *et al*., 2016) [2].

Research conducted Kim, Chung, Kim, Nielsen, Ishii, and O'Mahony (2018) [11], indicates that people tend to accept and eat foods that contain their preferred taste concentration. Their study measured the intake of pasta mixed with a sauce containing each participant's preferred salt concentration alongside concentrations of neutral palatability. The participants consistently accepted and ate most of the meal that had their preferred salt taste. Also, there is an increased satiation in response to stronger tasting foods (Sukkwai *et al*., 2018) [22]. This infers that the intensity of taste independently acts to dictate an eating event.

Taste intensity tends to modify the "within-meal" variance of palatability in a sensory-specific manner. Stronger taste dictates food acceptability since people normally associate the experience with the presence of food nutrients in the products (Sukkwai *et al*., 2018) [22]. The role of umami, for instance, is interesting in this regard since it is used to signal the presence of protein in the diet. Umami may be interpreted as savory deliciousness and appears to be a nutritional relevant sensory property. Greater sensitivity to umami is connected to the liking of protein-rich foods and thus protein deprivation leads to increased intake of savory food products (Li, Jervis, & Drake, 2015) [14]. In support of umami being a protein signal, researchers have indicated that umami taste can be applied to moderate the satiation experience when combined with protein-rich foods.

The other way taste affects food acceptability is through its application to reduced energy foods. Most research has been conducted concerning the effect of low-calorie sweeteners on appetite due to their ability to deliver sweet taste while reducing the energy provided by the sugar in sweet products. Findings by Bégin (2016) [1], indicate that consumption of artificially sweetened lower calories foods instead of their full energy versions promotes maintenance of an individual's weight. People thus tend to feel more satiated having consumed fewer calories of a product whose taste is unaffected.

When food is ingested, its taste provides the consumer with crucial information about its quality and thus its acceptability. There is a strong correlation between the quality of taste and product's palatability. For instance, adding sweetness or saltiness increases the palatability of a product thus enhancing its acceptability (Li, Jervis, & Drake, 2015) [14]. The ability of taste intensity to influence acceptability is shaped by the consumers' habitual exposures to different taste qualities over time. Certain taste signals can also be added to foods to help increase the satiation power of the nutrients present in the foods.

Texture

Texture can be defined as a multimodal-sensory food characteristic. It is described as the functional and sensory manifestation of surface, mechanical and structural properties of foods that are detected through kinesthetic, vision, hearing and touch. This sensory attribute of food is conceptualized through various ways such as thickness, creaminess, crunchiness, firmness, and smoothness (Tauferova *et al*., 2015) [23]. Just like taste and aroma, the texture is an indicator of food quality and it strongly affects food acceptability. People seem to consume different food types based on their texture. For instance, liquid foods tend to be consumed in large quantities as compared to solid foods. This is because, hard and chewy foods are consumed slowly and in smaller quantities as compared to foods with softer textual properties (Tauferova *et al*., 2015) [23]. Studies also indicate that people normally feel full after consuming solid foods as opposed to the consumption of softer foods.

Food texture also controls the belief about satiation effects of beverage or foods which ultimately influence food acceptance at a particular time period. Research indicates that foods that are thicker and chewier are believed by consumers to be more fulfilling (De Barros, & Cardoso, 2016) [5]. For instance, adding thick and creamy textural properties to a beverage increases the extent to which it is expected to satisfy the consumer. Interestingly, creamy flavors which do not alter the

original texture of the product tends to have less impact on the beverage's acceptability. Therefore, texture has a great impact on the oral processing of foods which in turn determines whether an individual will prefer a given product over the other.

After people learn the superior satiation power of the foods that appear chewier and hard, it is difficult to change this perception. Creamer, thicker and chewier foods that are mostly eaten slowly are normally nutrient-rich and they contain more fibers, carbohydrates, and proteins than the softer foods (De Barros, & Cardoso, 2016) [5]. Therefore, adding thicker, harder and chewier textural properties to beverages and foods without increasing the original energy content helps improve their acceptability.

Food texture is also critical in the development of food satiety. Particularly, there is a reported superior power of satiation of the solid foods as compared to liquid foods. According to De Barros and Cardoso (2016) [5], liquids that are consumed as beverages do not normally suppress appetite and subsequent energy intake as compared to solid or semi-solid versions of the same liquid foods. This is because, liquid drinks require minimal oral processing and thus do not illicit enough cephalic-phase preparatory responses (De Barros, & Cardoso, 2016) [5]. Solid foods, on the other hand, require chewing thus increases oro-sensory through the deliberate longer food processing in the mouth. This longer processing is linked to release of adequate gastro-intestinal peptide and increases the experience of satiety.

Gastrointestinal processing and the transit time taken by food is generally reduced for the liquid foods. This post-ingestive factor accounts for the weak satiation value of liquid foods. At the cognitive level, soups and solid foods are seen by consumers as more satiating since they are considered as foods for fullness while liquid foods such as beverages are mainly consumed in the context of quenching thirst. The combination of oro-sensory, cognitive and post-ingestive factors are thus critical in explaining the satiation effect of food texture on food acceptability.

Evidence from research that confirms the effect of texture on consumer satiety responses infers that manufacturers can easily use texture to improve satiation power and food acceptability among consumers. In overall, food texture is considered a fundamental determinant of food intake behavior and by extension food acceptability. Modifying liquid foods to be chewier or harder without adding calories improves satiation power and hence its acceptance (Wang *et al*., 2013) [24]. The textural property of food also determines the people's beliefs about the satiation power of foods. Lastly, textural properties influence the post-ingestive satiation value of food. All these effects combined, texture evidently affects the acceptability of a given food product.

Appearance

While most consumers believe that they are not easily fooled, their sense of taste is often deceived by their sense of sight. This is because every human being has his her expectations of how particular foods should look like. When the color of food is different from what consumers expect, the consumer believes the food will taste different. With regard to Endrizzi, Torri, Corollaro, Demattè, Aprea, Charles, and Gasperi, (2015) [6], consumers use visual cues to judge the quality of food they are meant to eat.

Color normally forms the first element realized in the appearance of a food product. Consumers associate colors with certain food types from their birth and equate these colors to certain flavors and taste throughout their life. For instance, consumers expect a yellow pudding to have a lemon or banana flavor (Endrizzi *et al*., 2015) [6]. In fresh foods, such as vegetable, consumers rely on the color to determine the level of freshness or ripeness of the product. If the product's color does not match consumer expectation, consumers will regard the product as substandard. Food companies are thus keen on utilizing this psychological aspect of consumption to find innovative ways of fulfilling the consumer's satisfaction and acceptability of various types of foods.

Food companies normally use artificial ways to imitate certain coloring of foods that occur naturally. For instance, adding red colorant on apples may convince the consumer that the product is sweeter (Endrizzi *et al*., 2015) [6]. Also, consumers tend to confuse flavors when drinks lack appropriate colors. For instance, a cherry drink that was manipulated to have a green color was thought by the participants to taste like lime. Research conducted by Bégin (2016) [1], sheds more light on the effect of color on food perception and acceptability. In the sturdy, colored streak and French fries was served in a room with a lighting effect that changed how the actual food looked like. The participants thought that the served food was fine. However, the participants lost their appetite after realizing that the French fries were died using green color while streak died with blue color. Some of the participants even became sick by the end of the experiment.

Researchers have established that food appearance determines how fulfilling the food is before its consumption. For instance, brown bread is considered to be more satiating as compared to the white bread. Satiety expectations of food are shown to be activated upon the visual appraisal of the particular food with cues such as size and variety driving the estimations, more so when it is a newly developed food. Therefore, food appearance is an important factor determining the selection and acceptability of food products beyond the simple initiation of a meal. The visual cues are relied on by consumers to decide when to eat, what to eat and which amounts to eat. The appearance of food also evokes expectations and beliefs about the satiating properties of the particular food which in turn enhances its acceptability.

Conclusion

The process through which an individual accepts or rejects food is considered to be of a multi-dimensional nature. There are three critical factors that determine food acceptability. They include consumer characteristics, sensory characteristics, and enjoyment of food. Sensory characteristics of food such as taste, texture, aroma, and appearance have distinct and influential effects on food acceptability. Therefore, a sensory attribute of food is considered the key area in which food manufacturers can successfully use to differentiate their products. Consumer characteristics which affect food acceptability include knowledge, innovativeness, attitude, belief, and perception of particular food products. Lastly, the ‘feel good' factor is also an essential determinant of food acceptability.

Recommendations

Further research is needed to explore the various ways in which factors that influence food acceptability can be utilized in formulating nutritional and sensory characteristics of food and beverages. The sensory signals produced by foods can be used by manufacturers to promote the acceptability of better

food choices beyond the extent to which a food is liked.

The understanding concerning taste system needs to be improved and scientists should focus on the role of emergent taste signals in both the short-term and long-term intake of foods. There is a need for further research to establish the relationship between individual preference for different taste and taste intensities and the reasons behind strong tasting foods being more palatable.

Also, future studies should investigate the combined and relative contribution of the sensory experience to pinpoint how they affect appetite and food acceptability. Also, additional research should be conducted to establish the extent to which energy reduction can be combined with a sensory enhancement to promote satiation and acceptability of food products.

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